

An aerial photograph of a vast mountain range, likely the Sierra Nevada, with numerous peaks and valleys. The mountains are covered in dense evergreen forests, and the valleys are filled with thick, white clouds or fog. The sky is a clear, deep blue with some wispy white clouds near the horizon. The overall scene is majestic and scenic.

OCO-2 Status

October 10, 2017

**David Crisp for the OCO-2
Science Team**

**Jet Propulsion Laboratory, California
Institute of Technology**



Overview

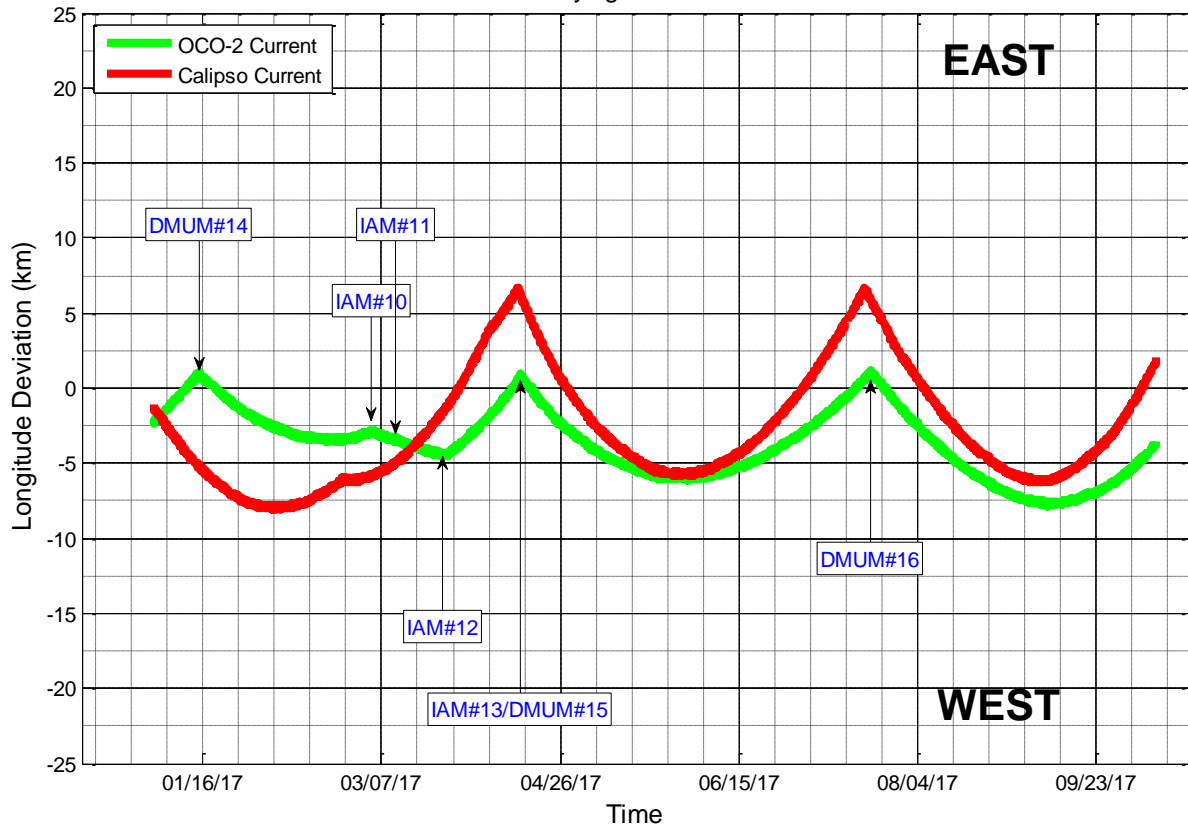
- **Observatory Status: Nominal**
 - The next Drag Makeup Maneuver is scheduled for 19 October 2017
 - Flight software patch for autonomous operations in final testing
- **Instrument Status: Collecting “Opportunistic Science” data**
 - Opportunistic Science observations were initiated SUNDAY 9/17
 - Science observations are collected 5 days/week and calibration data 2 days/week while flight software changes are implemented
- **V8 production is proceeding**
 - Level 2 B8r data are now available at the GES-DISC
 - First Look” presented here
 - V8a Lite files in production



OCO-2 Spacecraft Status

- The OCO-2 satellite continues to operate nominally
 - A flight software patch is in development to modify routine solar polar calibration and solar Doppler calibration activities (next slide)

Formation Flying Ground Track Error



The OCO-2 Navigation Team continues to maintain the orbit track to provide overlap between the OCO-2 nadir observations and the CALIPSO and CloudSat ground tracks.

The next Drag Makeup Maneuver (DMU#17) is scheduled for 19 October



Instrument Status – Opportunistic Science

- The solar calibration software patch
 - Because the calibration door potentiometer is no longer reliable, there is a small chance that the spacecraft will point the instrument directly at the sun for solar calibration without the diffuser deployed
 - To mitigate this risk, a flight software patch is being developed to point the instrument boresight 2.5 degrees away from the center of the solar disk during solar calibration, so that no direct sunlight enters the spectrometer slits
 - Final testing of this patch is ongoing, and may be complete this week
- While this patch is being developed a “human in the loop” approach is being used to safely collect a limited amount of “Opportunistic Science” and calibration data
 - The calibration door is deployed the desired position (solar, lamp, science) during the first ground contact of the day, and verified on the 2nd ground contact, and a full day data is collected in that mode
 - Opportunistic Science observations were (re)initiated on 9/17, and are yielding science data about 69.5% of the time since then



Opportunistic Science Collection

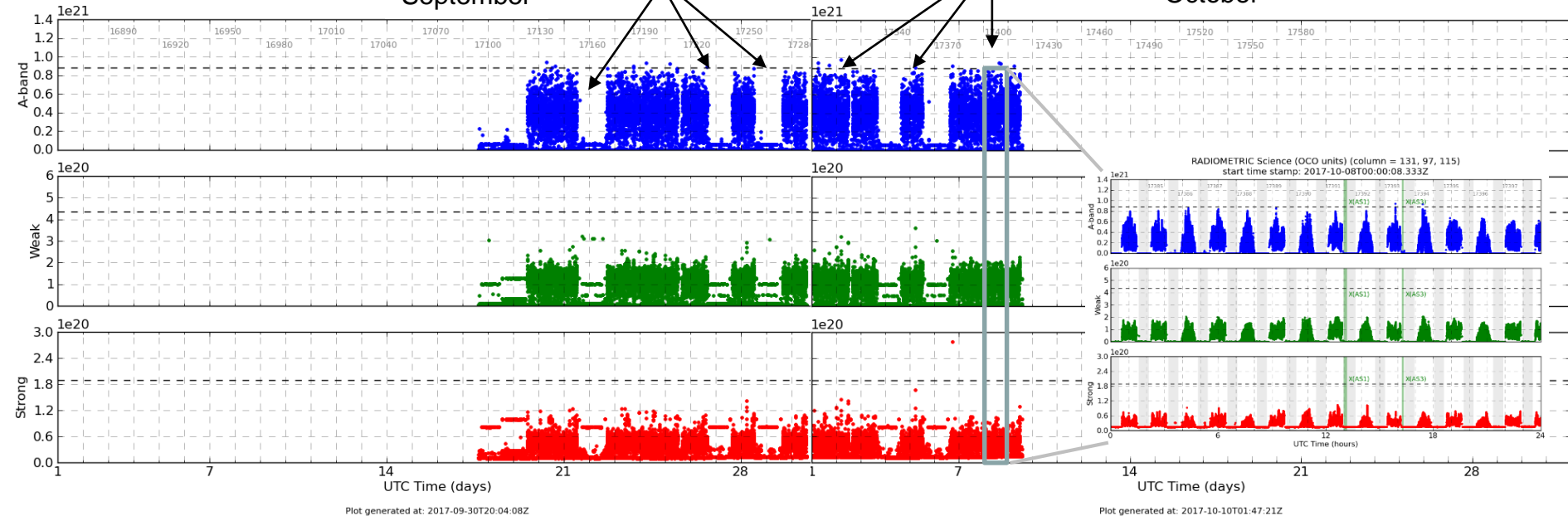
RADIOMETRIC Science (max/window) (OCO units) (column = 131, 97, 115)
start time stamp: 2017-09-17T14:45:23.000Z

September

Calibration

Science

October

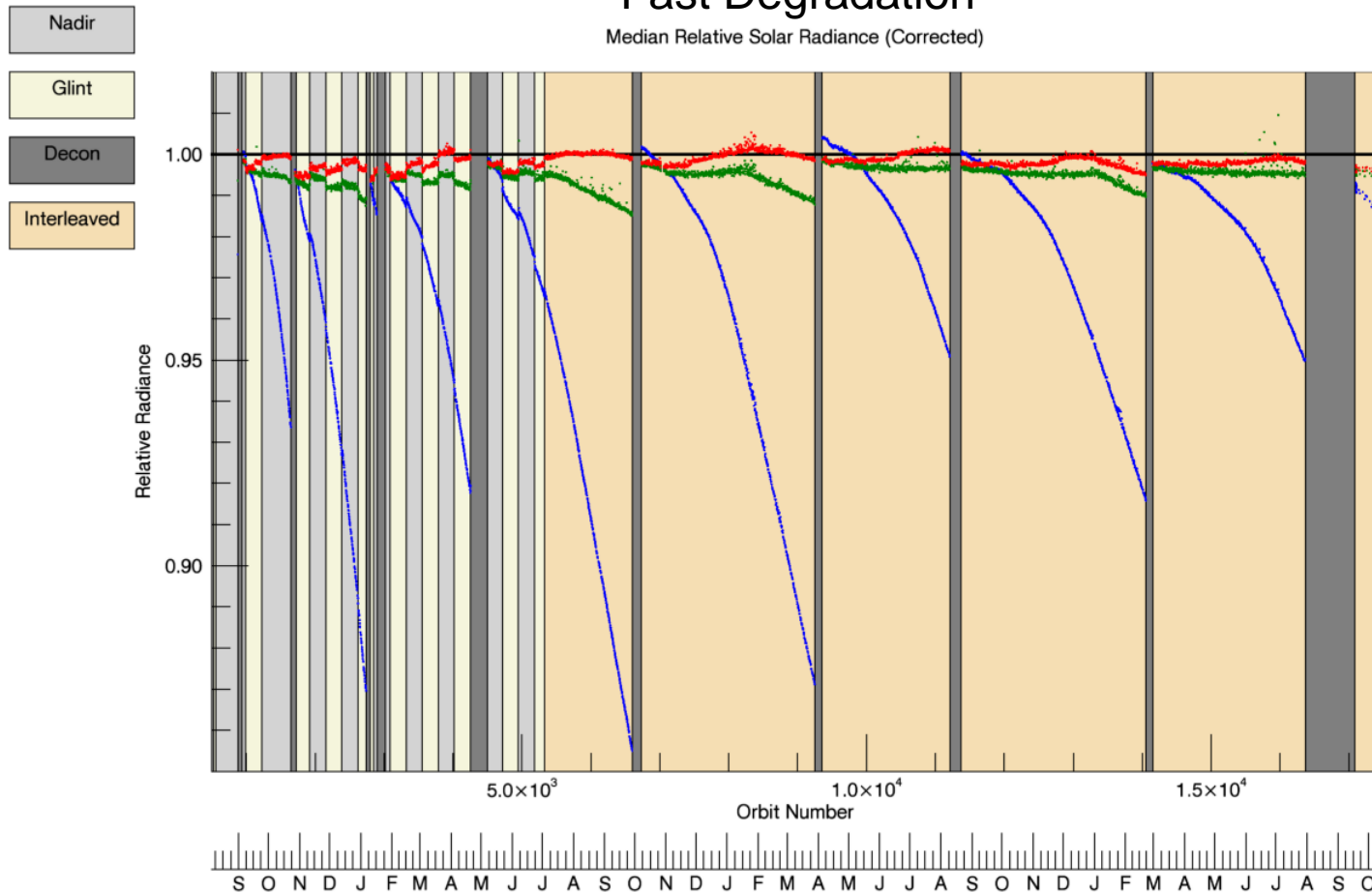


• color_slice_data_o2 • color_slice_data_weak_co2 • color_slice_data_strong_co2

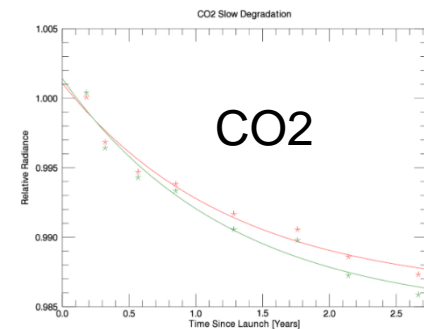
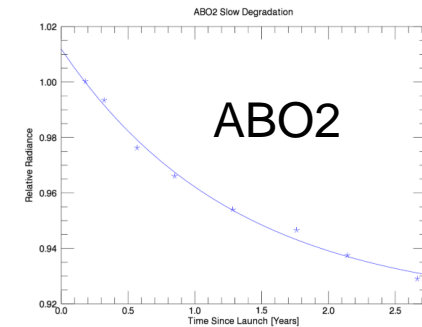
This figure illustrates the science and calibration scheduling for “Opportunistic Science” mode during late September and early October. On average, Science data are collected 69.45% of the time in this mode.



ABO2 Degradation Trending



Slow Degradation



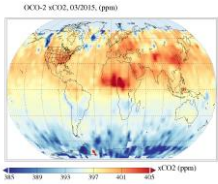
The fast and slow degradation are now trended separately. Only the fast degradation directly affects the science data optical path.

V8 Product – First Look





Status of the V8 Product



- The OCO-2 Version 8r (V8rdata products were delivered to the GES-DISC and on opened to the science community on 10/8/2017
- Key features include:
 - Updates to the L1b radiance file, improving the time dependence of the radiometric corrections (especially the a-band), and removal of a small, time dependent scattered light signal (ZLO)).
 - Updated spectroscopy and improved treatment of land surface reflectance (non-Lambertian BRDF)
 - The L2 algorithm now accounts for stratospheric aerosols, which has drastically reduced the X_{CO_2} errors in the Southern Hemisphere
 - Improvements to pre-screeners that increase data yield and latitudinal coverage
- The Lite Files production is ongoing. Delivery next week.
 - warn levels, now span 0 (50% of the data) to 5 (100% of the data).

<https://disc.gsfc.nasa.gov/datasets?keywords=%22OCO-2%208r%22>

https://docserver.gesdisc.eosdis.nasa.gov/public/project/OCO/OCO-2_DQ_Statement.pdf



Monthly Maps of the V8r Product - 2014

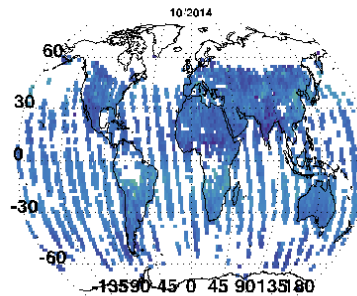
- Brendan Fisher produced global maps of the V8 Lite Product from a still incomplete version of the product (some months are missing) to assess the coverage and facilitate early validation efforts
- Each page includes one map each month
- In the version included here, the same scale bar was adopted for all maps, showing the annual trends, but obscuring small details

Coming soon

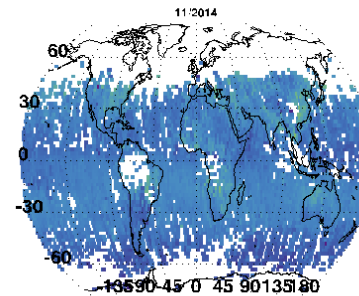
5 Oct 2017
B8

Sep 2014

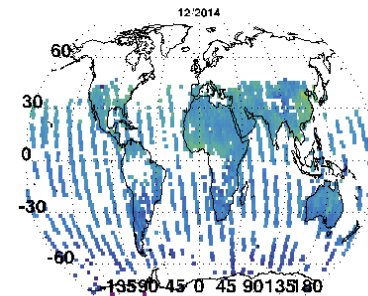
XCO₂ (ppm) 390.00 396.25 402.50 408.75 415.00



Oct 2014



Nov 2014

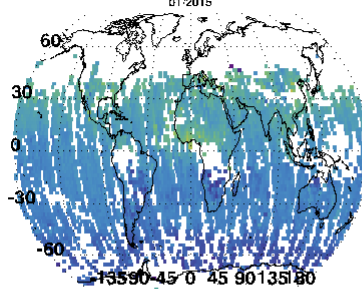


Dec 2014

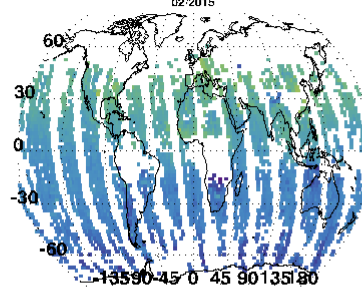


Monthly Maps of the V8 Product - 2015

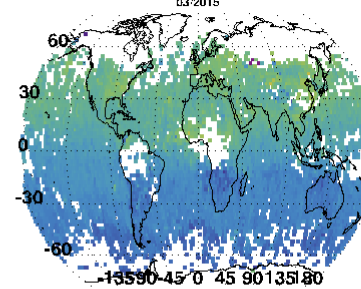
Jan 2015



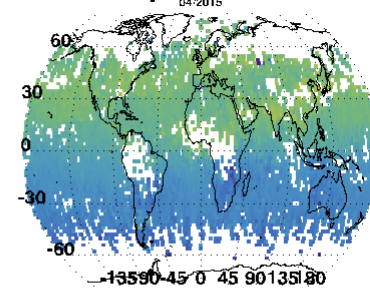
Feb 2015



Mar 2015



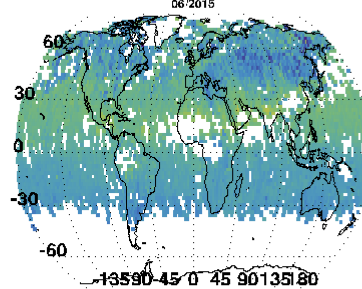
Apr 2015



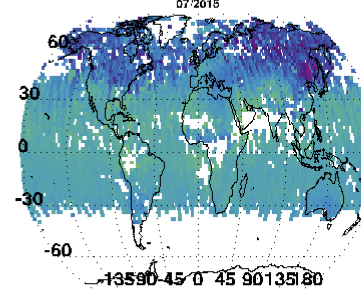
May 2015

Coming soon

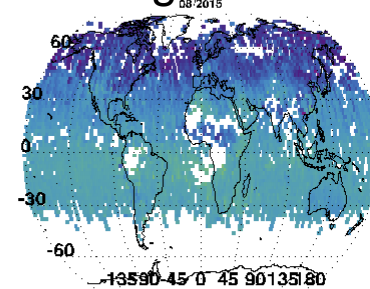
Jun 2015



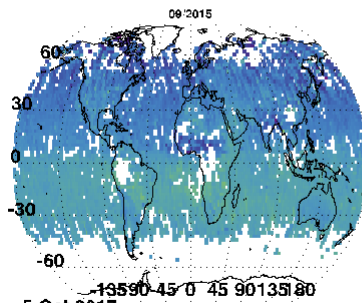
Jul 2015



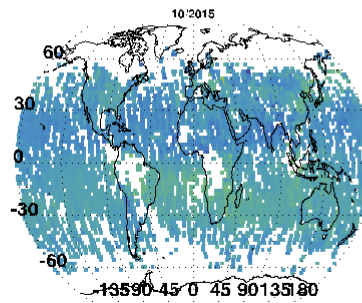
Aug 2015



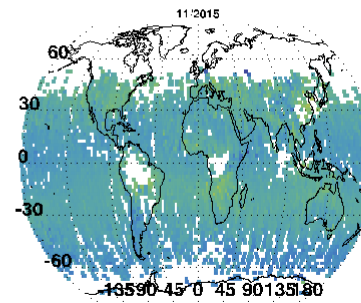
XCO2 (ppm) 390.00 396.25 402.50 408.75 415.00



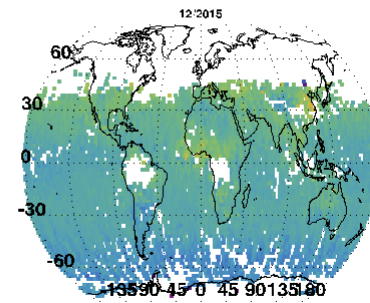
Sep 2015



Oct 2015



Nov 2015

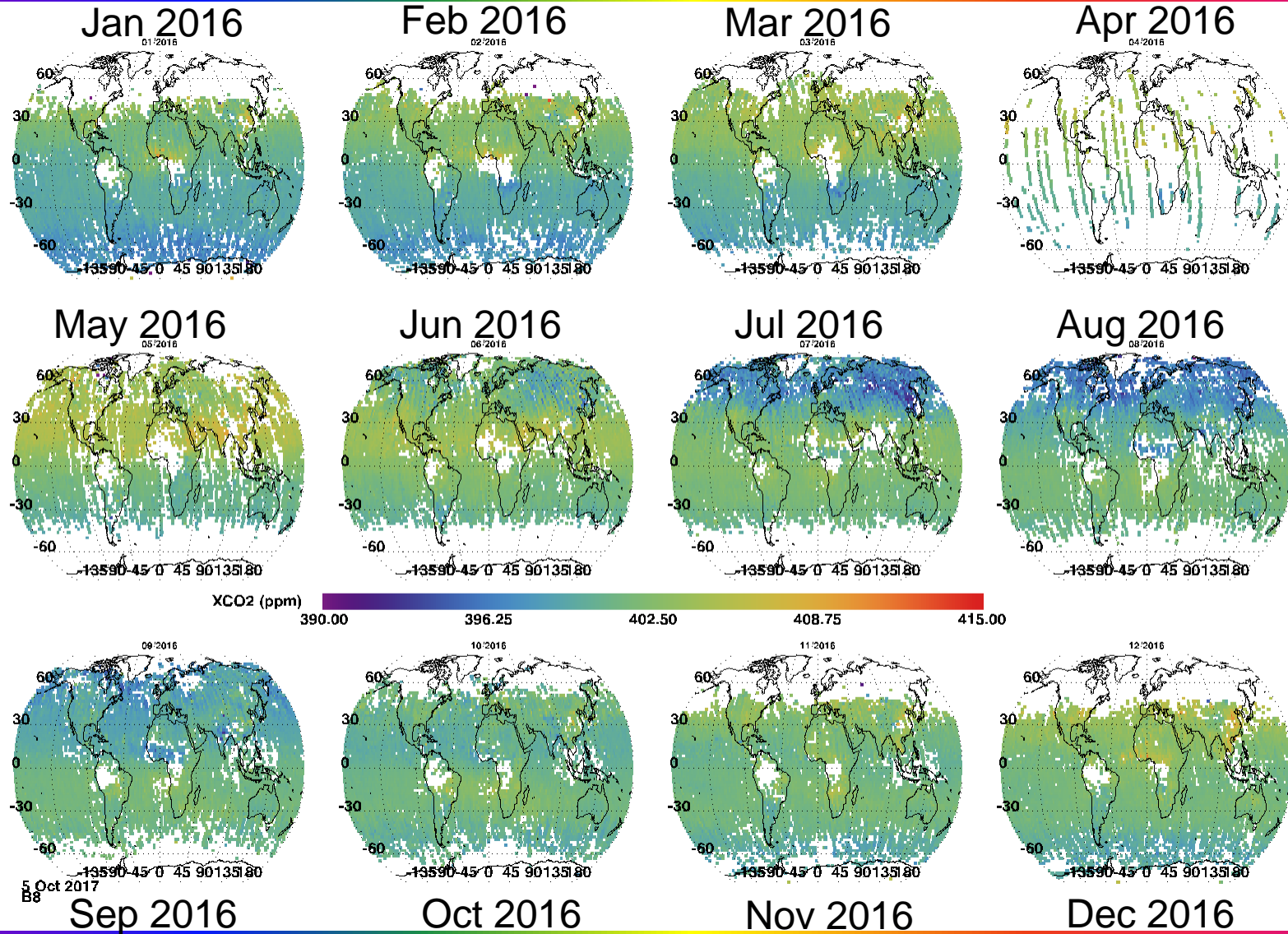


Dec 2015

5 Oct 2017
B8

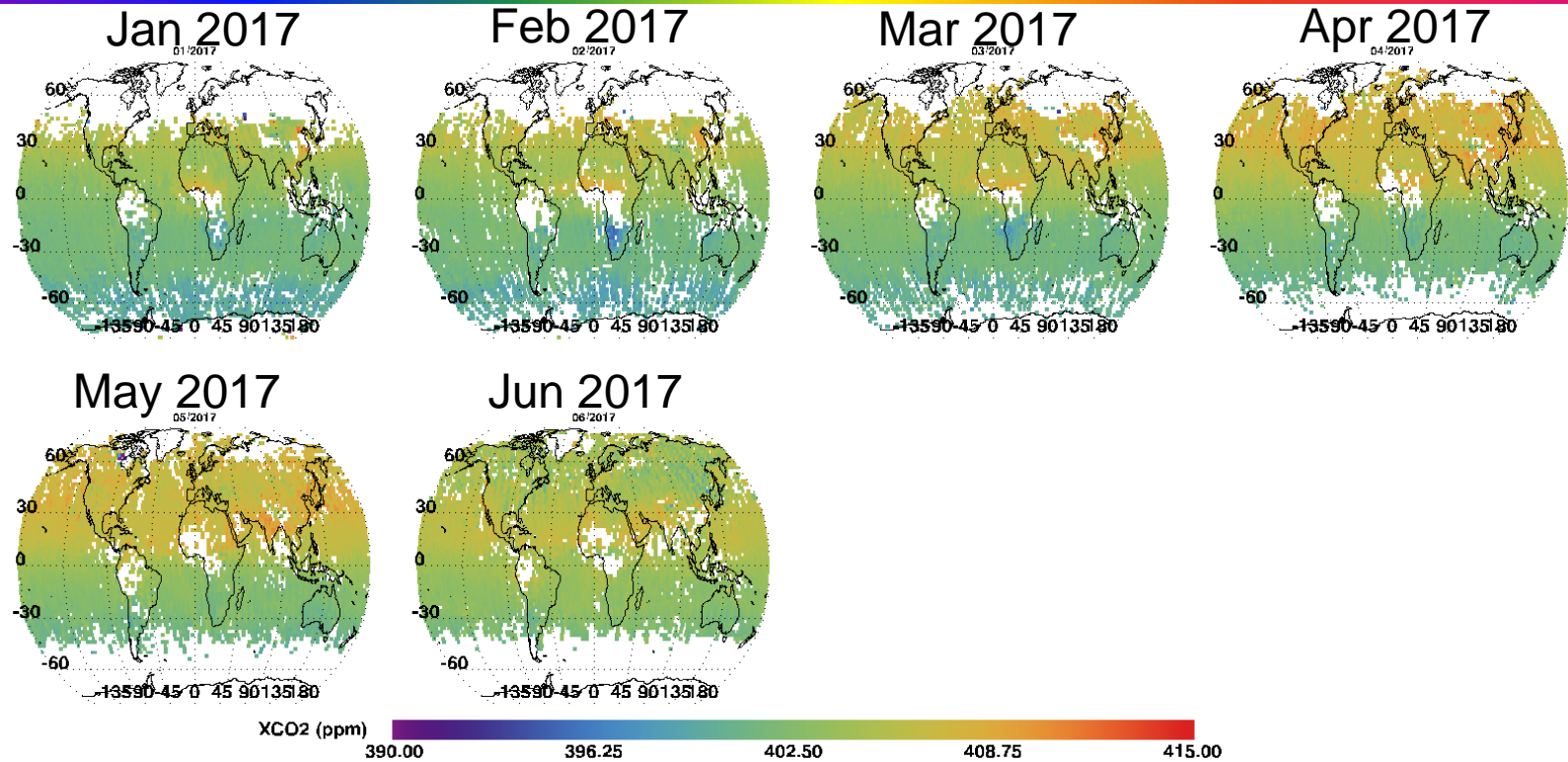


Monthly Maps of the V8 Product - 2016





Monthly Maps of the V8 Product - 2017

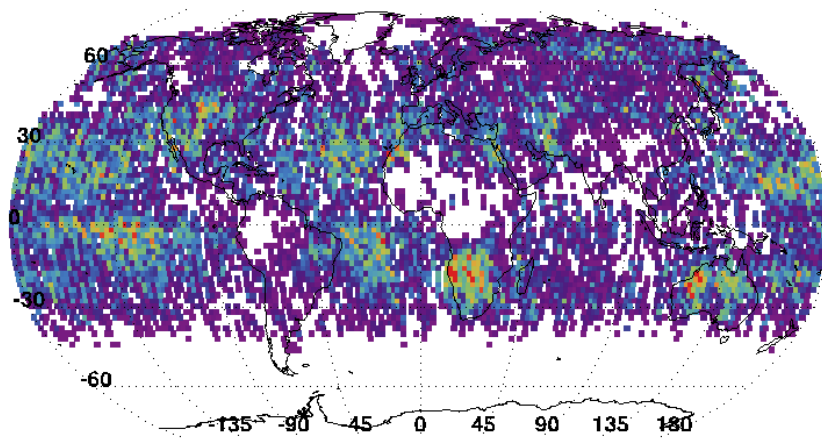


5 Oct 2017
B8



A Closer Look at a Few Months: Samples per 2x2 bin

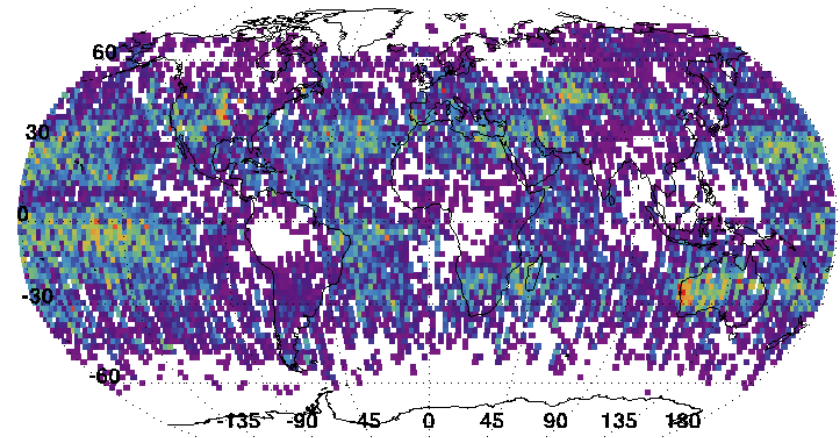
06/2016



Bin Count

0 500 1000 1500 2000

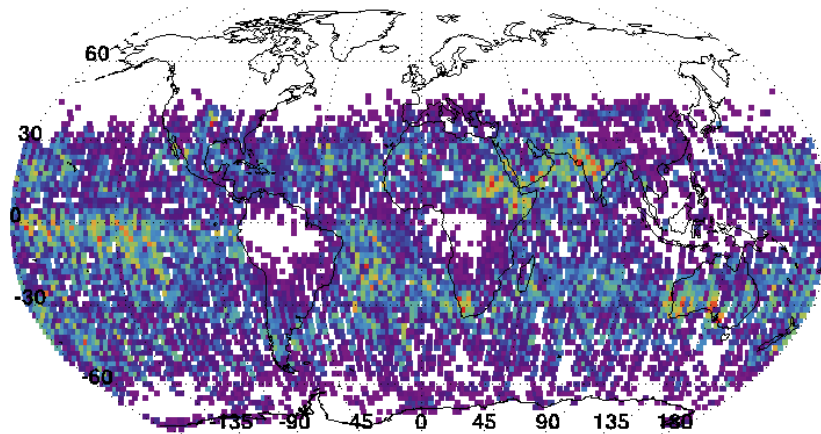
09/2016



Bin Count

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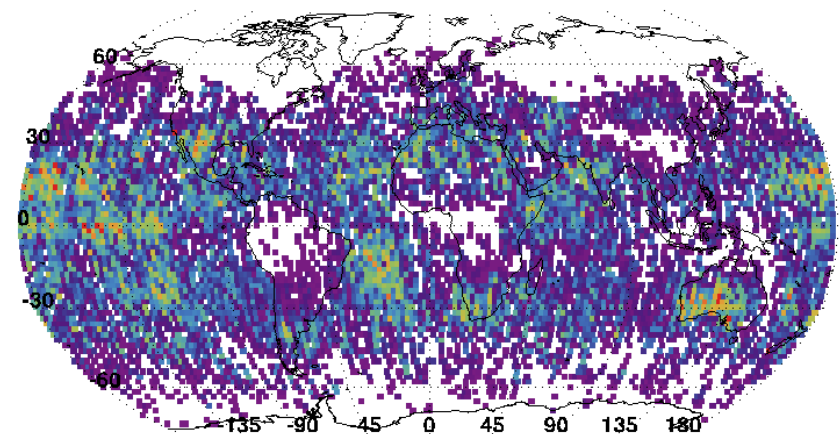
12/2016



Bin Count

0 500 1000 1500 2000

03/2017



Bin Count

0 500 1000 1500 2000

Oct 2017

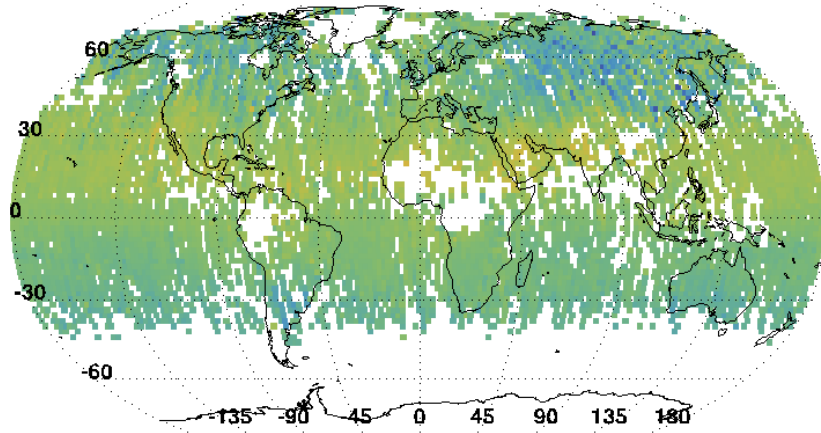
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0 500 1000 1500 2000



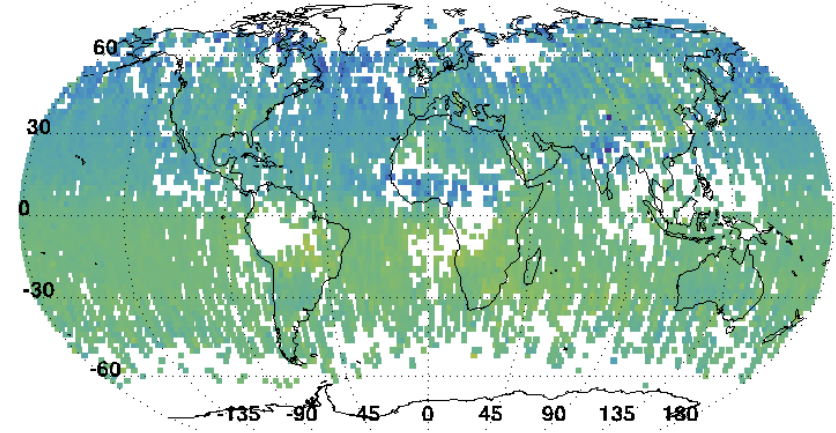
A Closer Look at a Few Months: X_{CO_2} (fixed color scale)

06/2016



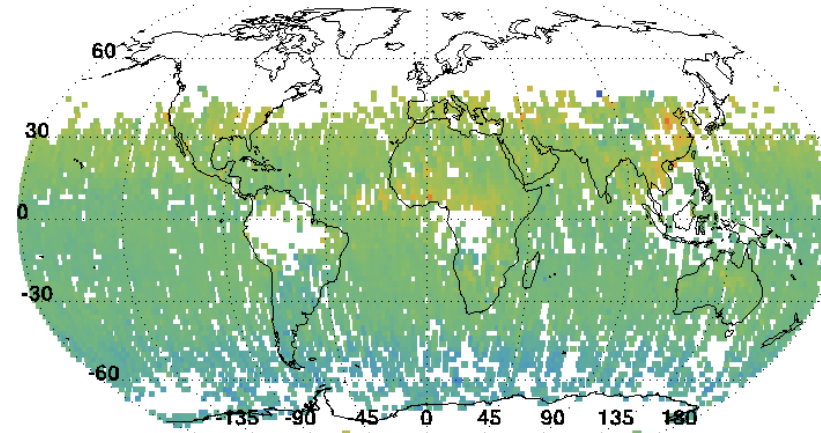
XCO₂ (ppm)
390.00 396.25 402.50 408.75 415.00

09/2016



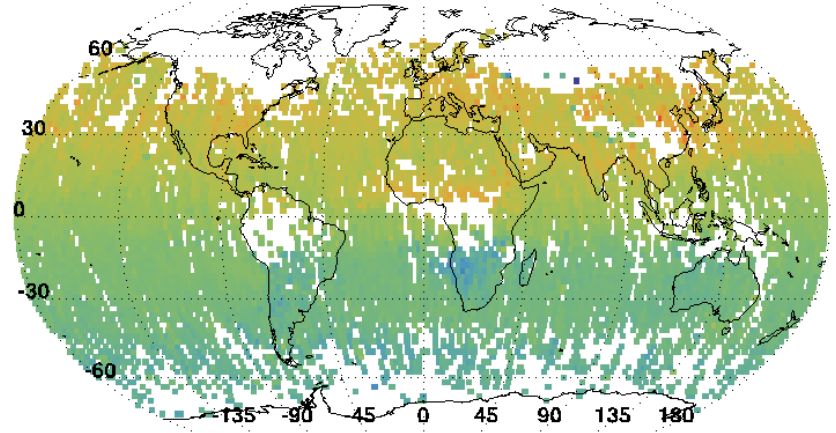
XCO₂ (ppm)
390.00 396.25 402.50 408.75 415.00

12/2016



XCO₂ (ppm)
390.00 396.25 402.50 408.75 415.00

03/2017



XCO₂ (ppm)
390.00 396.25 402.50 408.75 415.00

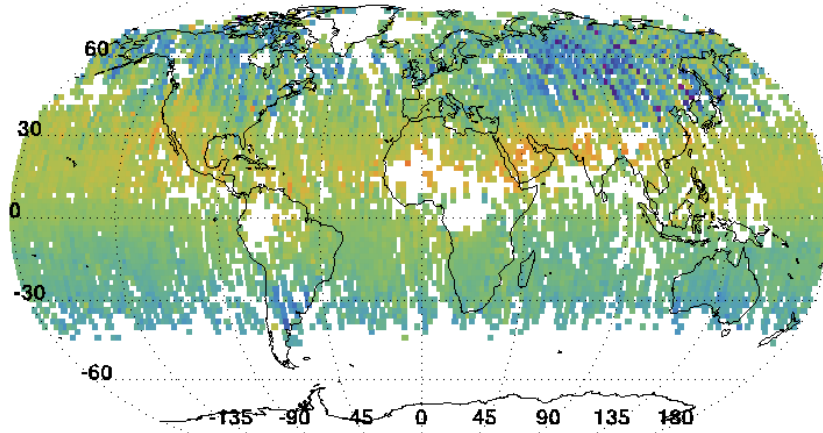
Oct 2017





A Closer Look at a Few Months: X_{CO_2} (optimized color scale)

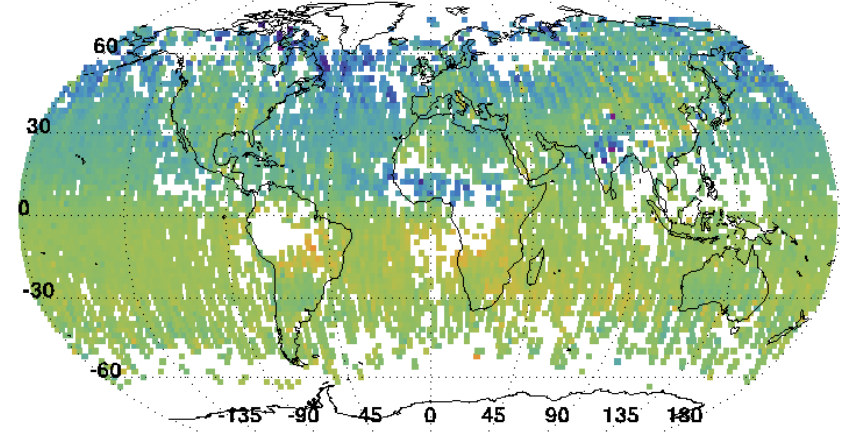
06/2016



XCO₂ (ppm)

394.84 398.59 402.34 406.09 409.84

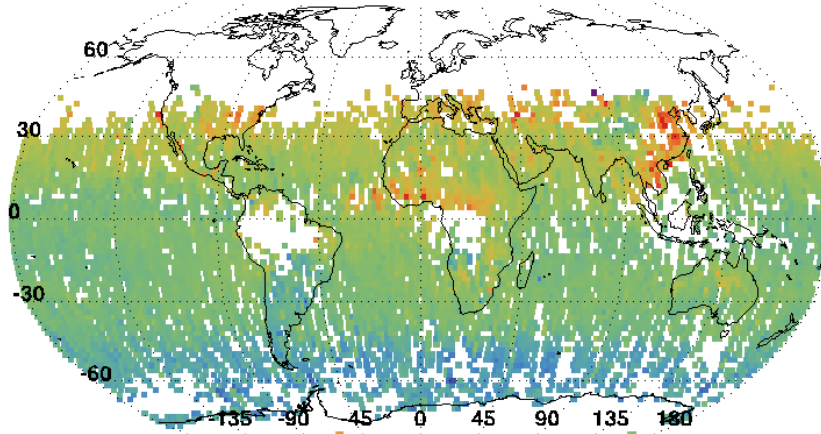
09/2016



XCO₂ (ppm)

393.12 396.87 400.62 404.37 408.12

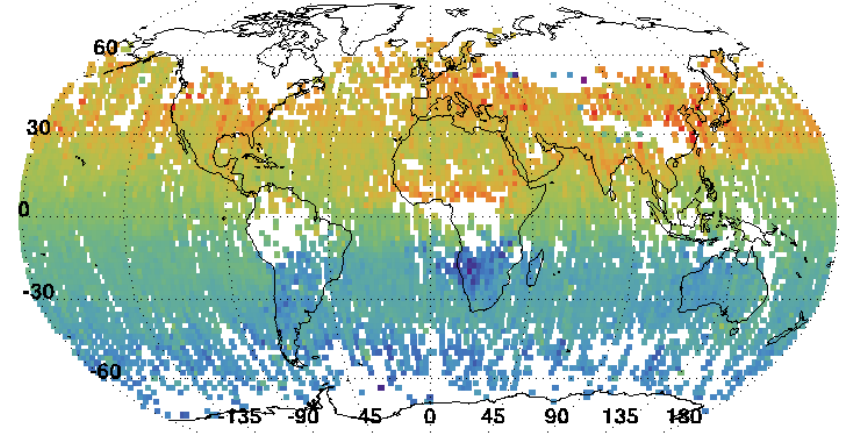
12/2016



XCO₂ (ppm)

5 Oct 2017 394.37 398.12 401.87 405.62 409.37

03/2017

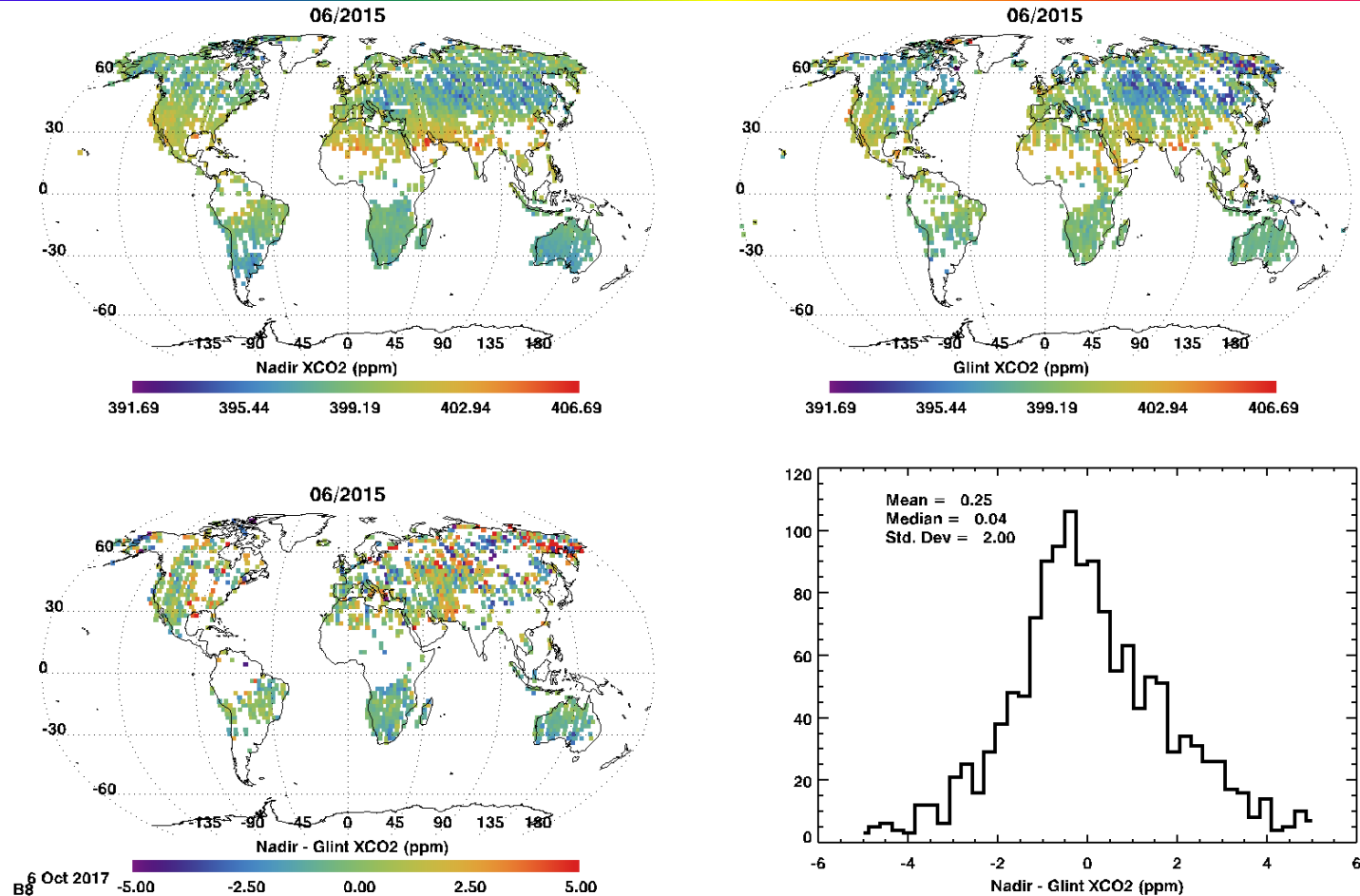


XCO₂ (ppm)

396.00 399.75 403.50 407.25 411.00



Apparent Striping over Land



Apparent “striping over land during some seasons was originally thought of to be a an artifact of the glint/nadir sampling, but is now thought to be a reflection of real changes in XCO₂ over the ~1-week intervals between the sampling of adjacent orbit tracks.



Initial Impressions

- The V8r dataset is less noisy and provides more coverage than the V7r product
 - There is some apparent “striping” over land, but this is most likely a consequence of changes in the XCO₂ over the week-long intervals between sampling of adjacent orbit tracks
- There is no evidence of the high bias at mid to high southern latitudes associated with stratospheric aerosols
- There appears to be little or no significant bias between the ocean and adjacent continents, but this warrants a more detailed investigation
- One thing that is slightly surprising is that none of the Antarctic data survived the screening and bias correction process